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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/771,813	02/03/2004	Xueshi Yang	S01.12-1013/STL 11469.00	3979
27365 7590 08/16/2007 SEAGATE TECHNOLOGY LLC C/O WESTMAN CHAMPLIN & KELLY, P.A. SUITE 1400 900 SECOND AVENUE SOUTH MINNEAPOLIS, MN 55402-3319			EXAMINER ETTEHADIEH, ASLAN	
			ART UNIT 2611	PAPER NUMBER
			MAIL DATE 08/16/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

Application No.

10/771,813

Applicant(s)

YANG ET AL.

Examiner

Aslan Ettehadieh

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 26 July 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) 17-29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11 and 13-16 is/are rejected.
- 7) ☒ Claim(s) 12 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments with respect to claims 1 – 16 have been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 4 is vague and indefinite because every possible state transition is not defined.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 6, 7, 11, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rouphael et al. (US 2003/0138040) in view Haunstein et al. (2003/0142740).
4. Regarding claim 1, Rouphael discloses a method of decoding data comprising: receiving a signal comprising a plurality of bit patterns at a bank of equalizers (figure 1 – 3, paragraphs 2, 16), each equalizer in the bank of equalizers tuned to a bit pattern with a corresponding equalization target (figures 1 – 3, elements Feedback

Art Unit: 2611

Equalizers/Filters, Rouphael does not explicitly disclose equalizers tuned to a bit pattern with a corresponding equalization target, however, it is well known to one skilled in the art at the time of invention was made that equalizers are known to function as being tuned to a bit pattern with a corresponding equalization target. This is done in order to accurately equalize the signal or signals. Applicant may refer to paragraph 56 of US 2006/0139646; abstract and paragraphs 5, 45, 48 of US 2004/0136717; col. 5 lines 6 – 18 of US 7107514; col. 5 lines 41 – 45 of US 6810168; to show that one skilled in the art at the time of invention was made would know equalizers are known to function as being tuned to a bit pattern with a corresponding equalization target); generating pattern dependent outputs from the equalizers (figure 1, output of elements 20, 30, paragraph 18); and calculating an estimated bit sequence with a detector using the pattern dependent outputs (figure 1 element Decision Device, paragraphs 18, 22). Rouphael also discloses equalizers each tuned to a different bit pattern (paragraphs 18, 22); however, Rouphael is not expressly clear about “different bit pattern”. Rouphael discloses that the first equalizer output a signal that represents the digital bit values and the second equalizer outputs a signal that represents an uncertainty of the decision made, and further that both equalizers operate slightly differently from each other.

In the same field of endeavor, however, Haunstein discloses equalizers each tuned to a different bit pattern (paragraphs 13, 17 and abstract; where Haunstein discloses this in a DFE equalization).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use equalizers each tuned to a different bit pattern as taught by Haunstein in the system of Roupheel to versatile adaptation.

5. Regarding claim 6, Roupheel further discloses wherein each equalizer includes an adaptive algorithm for tuning each equalizer to a bit pattern during use (paragraphs 24, 32, claims 10, 21, 31, 42).

6. Regarding claim 7, Roupheel discloses a method of decoding data comprising: processing a segment of a received signal in a bank of equalizers (figure 1 – 3, paragraphs 2, 16), each equalizer tuned to a bit pattern and an equalization target to produce an equalized output for each equalizer (figures 1 – 3, elements Feedback Equalizers/Filters, Roupheel does not explicitly disclose equalizers tuned to a bit pattern with a corresponding equalization target, however, it is well known to one skilled in the art at the time of invention was made that equalizers are known to function as being tuned to a bit pattern with a corresponding equalization target. This is done in order to accurately equalize the signal or signals. Applicant may refer to paragraph 56 of US 2006/0139646; abstract and paragraphs 5, 45, 48 of US 2004/0136717; col. 5 lines 6 – 18 of US 7107514; col. 5 lines 41 – 45 of US 6810168; to show that one skilled in the art at the time of invention was made would know equalizers are known to function as being tuned to a bit pattern with a corresponding equalization target); detecting a bit sequence using a branch metric calculation to process the equalized output (figure 1, output of elements 20, 30, Decision Device, paragraphs 18, 22). Roupheel also discloses equalizers each tuned to a different bit pattern (paragraphs 18, 22); however,

Rouphael is not expressly clear about "different bit pattern". Rouphael discloses that the first equalizer output a signal that represents the digital bit values and the second equalizer outputs a signal that represents an uncertainty of the decision made, and further that both equalizers operate slightly differently from each other.

In the same field of endeavor, however, Haunstein discloses equalizers each tuned to a different bit pattern (paragraphs 13, 17 and abstract; where Haunstein discloses this in a DFE equalization).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use equalizers each tuned to a different bit pattern as taught by Haunstein in the system of Rouphael to versatile adaptation.

7. Regarding claim 11, Rouphael discloses tuning each equalizer in the bank of equalizers to a bit pattern (figures 1 – 3, elements Feedback Equalizers/Filters, Rouphael does not explicitly disclose tuning each equalizer in the bank of equalizers to a bit pattern, however, it is well known to one skilled in the art at the time of invention was made that tuning each equalizer in the bank of equalizers to a bit pattern. This is done in order to accurately equalize the signal or signals. Applicant may refer to paragraph 56 of US 2006/0139646; abstract and paragraphs 5, 45, 48 of US 2004/0136717; col. 5 lines 6 – 18 of US 7107514; col. 5 lines 41 – 45 of US 6810168; to show that one skilled in the art at the time of invention was made would know tuning each equalizer in the bank of equalizers to a bit pattern).

Art Unit: 2611

8. Regarding claim 13, Rouphael discloses the branch metric calculation is a square of a difference between a received signal sample and a desired target signal determined by a state transition (paragraphs 18 – 28).

9. Claims 2 – 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rouphael et al. (US 2003/0138040) in view of Cideciyan et al. (US 6460150)

10. Regarding claim 2, Rouphael does not disclose the signal is received from a recording channel.

In the same field of endeavor, however, Cideciyan discloses the signal is received from a recording channel (figure 1, col. 3 lines 24 – 41).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use the signal is received from a recording channel as taught by Cideciyan in the system of Rouphael to allow for processing in numerous types of systems.

11. Regarding claim 3, Rouphael does not disclose reading a sequence of signal samples from a channel; and passing segments of the sequence of signal samples to the bank of equalizers one segment at a time.

In the same field of endeavor, however, Cideciyan discloses reading a sequence of signal samples from a channel; and passing segments of the sequence of signal samples to the bank of equalizers one segment at a time (figure 1, col. 3 lines 24 – 67; where the samples from an A/D converter would produce the one segment at a time, i.e. 8 bit A/D converter would provide an 8 bit segment).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use reading a sequence of signal samples from a channel; and passing segments of the sequence of signal samples to the bank of equalizers one segment at a time as taught by Cideciyan in the system of Rouphael to proper processing (i.e. to avoid overflow).

12. Claims 4 – 5, 9 – 10, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rouphael et al. (US 2003/0138040) in view of Moon, J. and Park, J. "Pattern-Dependent Noise Prediction in Signal-Dependent Noise" IEEE Journal on Selected Areas in Communications, vol. 19, no. 4, April 2001.

13. Regarding claim 4, Rouphael does not disclose calculating a path metric for every possible state transition sequence of a bit pattern using the pattern dependent equalizer outputs according to transition information; and selecting a bit sequence corresponding to a path having the smallest accumulated path metric.

In the same field of endeavor, however, Moon discloses calculating a path metric for every possible state transition sequence of a bit pattern using the pattern dependent equalizer outputs according to transition information; and selecting a bit sequence corresponding to a path having the smallest accumulated path metric (Section I paragraphs 1 – 2, Section II steps 1 – 3, Section III B paragraph 1, Section III C paragraph 2).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use calculating a path metric for every possible state transition sequence of a bit pattern using the pattern dependent equalizer outputs according to



Art Unit: 2611

transition information; and selecting a bit sequence corresponding to a path having the smallest accumulated path metric as taught by Moon in the system of Rouphael to provide better performance and reduce noise (Section IX).

14. Regarding claims 5 and 14, Rouphael does not disclose each equalizer includes a pattern-dependent filter.

In the same field of endeavor, however, Moon discloses each equalizer includes a pattern-dependent filter (Section I).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use each equalizer includes a pattern-dependent filter as taught by Moon in the system of Rouphael to provide better performance and reduce noise (Section IX).

15. Regarding claim 9, Rouphael does not disclose the equalized output is used in sequence detection according to the bit pattern associated with the equalizer.

In the same field of endeavor, however, Moon discloses the equalized output is used in sequence detection according to the bit pattern associated with the equalizer (Section I).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use the equalized output is used in sequence detection according to the bit pattern associated with the equalizer as taught by Moon in the system of Rouphael to provide better performance and reduce noise (Section IX).

16. Regarding claim 10, Rouphael does not disclose a number of equalizers in the bank of equalizers is determined by a maximum number of possible states for a selected pattern window.

In the same field of endeavor, however, Moon discloses a number of equalizers in the bank of equalizers is determined by a maximum number of possible states for a selected pattern window (Section I paragraphs 1 – 2, Section II steps 1 – 3, Section III B paragraph 1, Section III C paragraph 2).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use a number of equalizers in the bank of equalizers is determined by a maximum number of possible states for a selected pattern window as taught by Moon in the system of Rouphael to provide better performance and reduce noise (Section IX).

17. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rouphael et al. (US 2003/0138040) in view of Kwon et al. (US 2004/0156459).

18. Regarding claim 8, Rouphael is not explicit about dividing the segment of the received signal into finite overlapped segments, and calculating an equalized output for each of the finite segments with the bank of equalizers.

In the same field of endeavor, however, Kwon discloses dividing the segment of the received signal into finite overlapped segments, and calculating an equalized output for each of the finite segments with the bank of equalizers (paragraphs 53, 61, 67).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use dividing the segment of the received signal into finite

Art Unit: 2611

overlapped segments, and calculating an equalized output for each of the finite segments with the bank of equalizers as taught by Kwon in the system of Roupael to save on processing power.

19. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roupael et al. (US 2003/0138040) in view of Ojard et al. (US 2005/0031061).

20. Regarding claim 15, Roupael is not explicit about the branch metric calculation is based on a noise whitening principle when noise in the received signal is correlated (the branch metric calculation is based on a noise whitening principle: paragraphs 16 – 17, 37).

In the same field of endeavor, however, Ojard discloses the branch metric calculation is based on a noise whitening principle when noise in the received signal is correlated (paragraph 115).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use the branch metric calculation is based on a noise whitening principle when noise in the received signal is correlated as taught by Ojard in the system of Roupael to reduce the noise power (paragraph 115).

21. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roupael et al. (US 2003/0138040) in view of Linnartz et al. (US 2002/0181549).

22. Regarding claim 16, Roupael is not explicit about the branch metric calculation is based on a covariance matrix of noise when noise in the received signal is correlated.

In the same field of endeavor, however, Ojard discloses the branch metric calculation is based on a covariance matrix of noise when noise in the received signal is correlated (paragraph 6).

Therefore it would have been obvious to one skilled in the art at the time of invention was made to use the branch metric calculation is based on a covariance matrix of noise when noise in the received signal is correlated as taught by Ojard in the system of Rouphael to reduce the complexity (paragraph 6).

***Allowable Subject Matter***

23. Claim 12 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

Art Unit: 2611

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

**Contact Information**


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aslan Ettehadieh whose telephone number is (571) 272-8729. The examiner can normally be reached on Monday - Friday, 8:00am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on (571) 272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Aslan Ettehadieh  
Examiner  
Art Unit 2611

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DAVID C. PAYNE  
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